Slide 1

Lumpy Skin Disease

Pseudourticaria, Neethling Virus Disease, Exanthema Nodularis Bovis, Knopvelsiekte

Lumpy skin disease is also referred to as pseudourticaria, neethling virus disease, exanthema nodularis bovis, and knopvelsiekte.

Slide 2

Overview

- Organism
- Economic Impact
- Epidemiology
- Transmission
- Clinical Signs
- Diagnosis and Treatment
- Prevention and Control
- Actions to Take

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In today's presentation we will cover information regarding the organism that causes Lumpy Skin Disease and its epidemiology. We will also talk about the economic impact the disease has had in the past and could have in the future. Additionally, we will talk about how it is transmitted, the species it affects, clinical and necropsy signs seen, and diagnosis and treatment of the disease. Finally, we will address prevention and control measures for the disease as well as actions to take if Lumpy Skin Disease is suspected.

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The Organism

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Lumpy Skin Disease Virus

- Family Poxviridae
  - Genus *Capripoxvirus*
- Closely related to sheep and goat pox
- Cannot be differentiated with serology

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Lumpy skin disease (LSD) is an acute to chronic viral disease of cattle that is characterized by skin nodules. Lumpy skin disease is caused by a virus in the family Poxviridae, genus *Capripoxvirus*. It is closely related antigenically to sheep and goat pox viruses. These viruses cannot be differentiated using routine serological testing.

(Photos: USDA-APHIS)

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Importance

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History and Geographic Distribution

- 1929: Southern and eastern Africa
- Disease of cattle
- Experimental infection
  - Oryx, giraffe, and impala

- Virus will replicate in sheep and goats
- 1990s: Resurgence in Africa

LSD was first described in Zambia (then Northern Rhodesia) in 1929 and extended northwards through sub-Saharan West Africa through a series of epizootics through the 1960s. LSD is a disease of cattle, but the oryx, giraffe, and impala are susceptible to experimental infection. The role of wildlife in transmission or as reservoir is unknown. LSD virus will also replicate in sheep and goats following inoculation. During the 1990s there was a resurgence of the disease in southern Africa, probably owing to high rainfall and low levels of host immunity.

(Photo: USDA-APHIS)

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Economic Impact

- Major economic importance due to loss of production
  - Severe emaciation
  - Lowered milk production
  - Abortion
  - Secondary mastitis
  - Loss of fertility
  - Extensive damage to hides
  - Loss of draft from lameness

Although the mortality rate is usually low, the disease is of major economic importance due to production losses resulting from severe emaciation, lowered milk production, abortion, secondary mastitis, loss of fertility, extensive damage to hides, and a loss of draft from lameness.

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Epidemiology

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Morbidity/ Mortality

- Morbidity
  - Widely variable
  - 3% to 85%
- Mortality
  - Usually low
  - 1% to 3%
  - 20% to 85% in some outbreaks

The morbidity rate in cattle can vary from 3 to 85% depending on the presence of insect vectors and host susceptibility. Mortality is low in most cases (1 to 3%), but can be as high as 20 to 85%. Unusually high mortality rates (75 to 85%) in some outbreaks have not been explained.

(Photo: USDA-APHIS)

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Transmission

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Animal Transmission

- Primary route: biting insects
- Minor route: direct contact
  - Cutaneous lesions, saliva, nasal discharge, milk, semen, muscles
- Resistant to desiccation
- No carrier state
- Spread related to movement of cattle

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Transmission of the LSD virus is primarily by biting insects, particularly mosquitoes (e.g. *Culex mirificens* and *Aedes natrionus*). Epidemics occur in the rainy seasons. Direct contact is also a minor source of infections. Virus can be present in cutaneous lesions, saliva, nasal discharge, milk, and semen. The virus can survive in desiccated crusts for up to 35 days. There is no carrier state. The spread of the disease is often related to the movement of cattle.

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Animals and Lumpy Skin Disease

Slide 13

Clinical Signs

- Incubation period
  - 2 to 5 weeks
- Inapparent to severe infection
  - Young calves most susceptible
- Nodule development
- Decreased milk yield

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The incubation period varies from 2 to 5 weeks. Clinical signs can range from inapparent to severe. Host susceptibility, dose, and route of virus inoculation affect the severity of disease. Young calves often have more severe disease. Nodules on the skin and mucous membranes develop; they vary from 1 cm to 7 cm and penetrate the full thickness of the skin. Feed intake and milk yield may also decrease.

(Photos: USDA-APHIS)

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Clinical Signs

- Raised, circular, firm, coalescing nodules
  - Common on head, neck, udder, perineum, legs
  - Cores of necrotic material called "sit-fasts"
- Secondary bacterial infections
- Rhinitis, conjunctivitis
- Lameness
- Abortion and sterility

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Skin nodules may be few in number to many hundreds, and may coalesce to form plaques. Nodules may occur on any part of the body, but they are particularly common on the head, neck, udder, genitalia, perineum, and legs. Swollen skin nodules may separate from the healthy skin and dry and harden to form a "sit-fast". Secondary bacterial infections may occur. Rhinitis and conjunctivitis can also been seen. Lameness may result from inflammation and edema of the legs, and abortion and sterility may occur in both bulls and cows.

(Photos: USDA-APHIS)

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Post Mortem Lesions

- Characteristic skin nodules
- Lesions in the mucous membranes throughout the GI tract
- Nodules in lungs
- Hemorrhages in spleen, liver, rumen

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Post mortem lesions can be extensive. Characteristic deep nodules are found in the skin which penetrate into the subcutaneous tissues and muscle with congestion, hemorrhage, and edema. Lesions may also be found in the mucous membranes of the oral and nasal cavities as well as the gastrointestinal tract, lungs, testicles, and urinary bladder. Bronchopneumonia may be present, and enlarged superficial lymph nodes are common. Synovitis and tenosynovitis may be seen with fibrin in the synovial fluid. The top photo shows lesions in the oral cavity; the lower photo is a sitfast.

(Photos: USDA-APHIS)

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Differential Diagnosis

- Pseudo-lumpy skin disease
- Bovine herpes mammillitis
- Dermatophilosis
- Ringworm
- Insect or tick bites
- Rinderpest
- Demodicosis
- *Hypoderma bovis* infestation
- Photosensitization
- Bovine papular stomatitis
- Urticaria
- Cutaneous tuberculosis
- Onchocercosis

Differential diagnoses include pseudo-lumpy skin disease (a much milder disease caused by a herpesvirus), bovine herpes mammillitis (a disease with lesions generally confined to the teats and udder), dermatophilosis, ringworm, insect or tick bites, besnoitiosis, rinderpest, demodicosis, *Hypoderma bovis* infestation, photosensitization, bovine papular stomatitis, urticaria, cutaneous tuberculosis, and onchocercosis.

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Sampling

- Before collecting or sending any samples, the proper authorities should be contacted
- Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease

Before collecting or sending any samples from animals with a suspected foreign animal disease, the proper authorities (state and/or federal veterinarian) should be contacted. Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease.

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Diagnosis

- Clinical
  - Characteristic skin nodules
- Laboratory
  - Virus isolation and identification
  - Electron microscopy in combination with history
  - Serology: cross-reactions with other poxviruses may occur

LSD can be suspected when characteristic skin nodules, fever, and swollen lymph nodes are seen. Confirmation of lumpy skin disease in a new area requires virus isolation and identification. Antigen testing can be done using direct immunofluorescent staining, virus neutralization, or ELISA. Typical capripox (genus) virions can be seen using transmission electron microscopy of biopsy samples or desiccated crusts. This finding, in combination with a history of generalized nodular skin lesions and lymph node enlargement in cattle, can be diagnostic. Serological tests include an indirect fluorescent antibody test, virus neutralization, Western blot, and ELISA. Cross-reactions may occur with other poxviruses.

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Treatment

- Animals generally recover with good nursing care
- Antibiotics for secondary infection
- Up to 6 months for severely affected animals to recover fully

Animals infected with LSD virus generally recover. Complete recovery may take several months and may be prolonged when secondary bacterial infections occur. Treatment is directed at preventing or controlling secondary infection. It may take up to 6 months for animals severely affected by LSD virus to recover fully. Administration of antibiotics to control secondary infection and good nursing care are recommended.

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Lumpy Skin Disease in Humans

There is no evidence that the lumpy skin disease virus affects humans.

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Prevention and Control

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Recommended Actions

- IMMEDIATELY notify authorities
- Federal
  - Area Veterinarian in Charge (AVIC)
    http://www.aphis.usda.gov/animal_health/area_offices/
- State
  - State veterinarian
    http://www.usaha.org/StateAnimalHealthOfficials.pdf
- Quarantine

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If you suspect a case of LSD, state or federal authorities should be notified immediately. Animals suspected with LSD should be isolated, and the farm should be quarantined until definitive diagnosis is determined.

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Disinfection

- Susceptible to:
  - Ether (20%)
  - Chloroform
  - Formalin (1%)
  - Some detergents
  - Phenol (2% for 15 minutes)
- Can survive up to 35 days in the environment in desiccated scabs

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LSD virus is susceptible to ether (20%), chloroform, formalin (1%) and some detergents (sodium dodecyl sulphate), as well as phenol (2% for 15 minutes). It can survive for long periods in the environment – up to 35 days in desiccated scabs and 18 days in air-dried hides.

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Control and Eradication

- Endemic areas
  - Vaccinate cattle
  - Insect control
- Non-endemic areas
  - Keep free with import restrictions
  - Quarantine
  - Depopulation, proper carcass disposal
  - Cleaning and disinfection

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Outbreaks can be eradicated by quarantines, depopulation of infected and exposed animals, proper disposal of carcasses, cleaning and disinfection of the premises and insect control. The most likely way for LSD to enter a new area is by introduction of infected animals. Biting insects that have fed on infected cattle may travel or be blown for substantial distances. It is believed that LSD spread to Israel via contaminated insects that were blown across the Sinai Desert. The movement of contaminated hides represents another potential means for transmission.

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Vaccination

- Endemic areas, eradication efforts
- Attenuated LSD strain
  - Used in South Africa
  - Neethling strain vaccine confers immunity up to 3 years
- Sheep and goat pox vaccine
  - Used in east, north Africa
  - May cause local, severe reaction

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In endemic areas, vaccination against LSD has been successfully practiced. Vaccines were helpful in eradication during an outbreak in Israel. In the Union of South Africa, an attenuated LSD vaccine is used. Vaccination with the Neethling strain confers immunity up to 3 years. In Kenya and Egypt the Romanian strain of sheep and goat pox vaccine has been used successfully for prophylaxis against LSD. Sheep pox vaccine may cause local, sometimes severe, reactions and is not advised in countries that are free from sheep and goat pox.

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Additional Resources

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Additional Resources

- World Organization for Animal Health (OIE)
  - www.oie.int
- U.S. Department of Agriculture (USDA)
  - www.aphis.usda.gov
- Center for Food Security and Public Health
  - www.cfsph.iastate.edu
- USAHA Foreign Animal Diseases ("The Gray Book")
  - www.usaha.org/pubs/fad.pdf

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Acknowledgments

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Authors: *Katie Steneroden, DVM; Kristina August, DVM; Radford Davis, DVM, MPH, DACVPM*

Reviewers: *Bindy Comito Sornsin, BA; Katie Spaulding, BS; Kerry Leedom Larson, DVM, MPH, PhD*